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Fig. 1

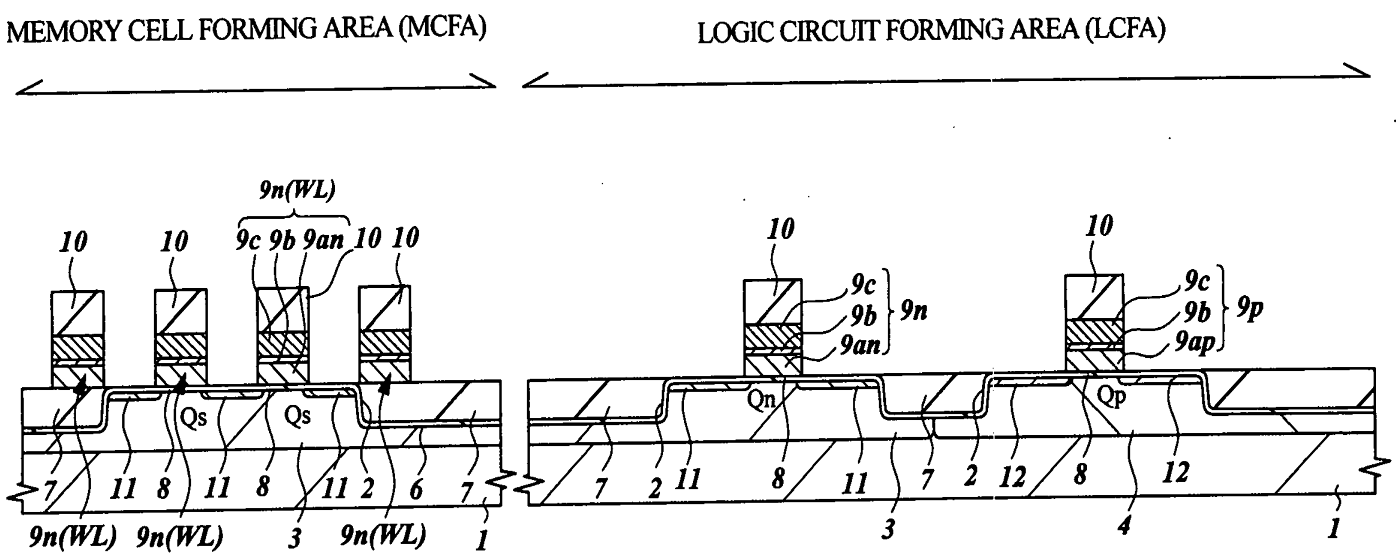

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
9n(WL)
10
10
9c 9b 9an 10 10
Qs
Qs
7
11
8
11
8
11
2
6
7
9n(WL)
9n(WL)
3
9n(WL)
1
10
9c
9b
9an
9n
10
9c
9b
9ap
9p
Qn
Qp
7
2
11
8
11
7
2
12
8
12
3
4
1

Fig. 2

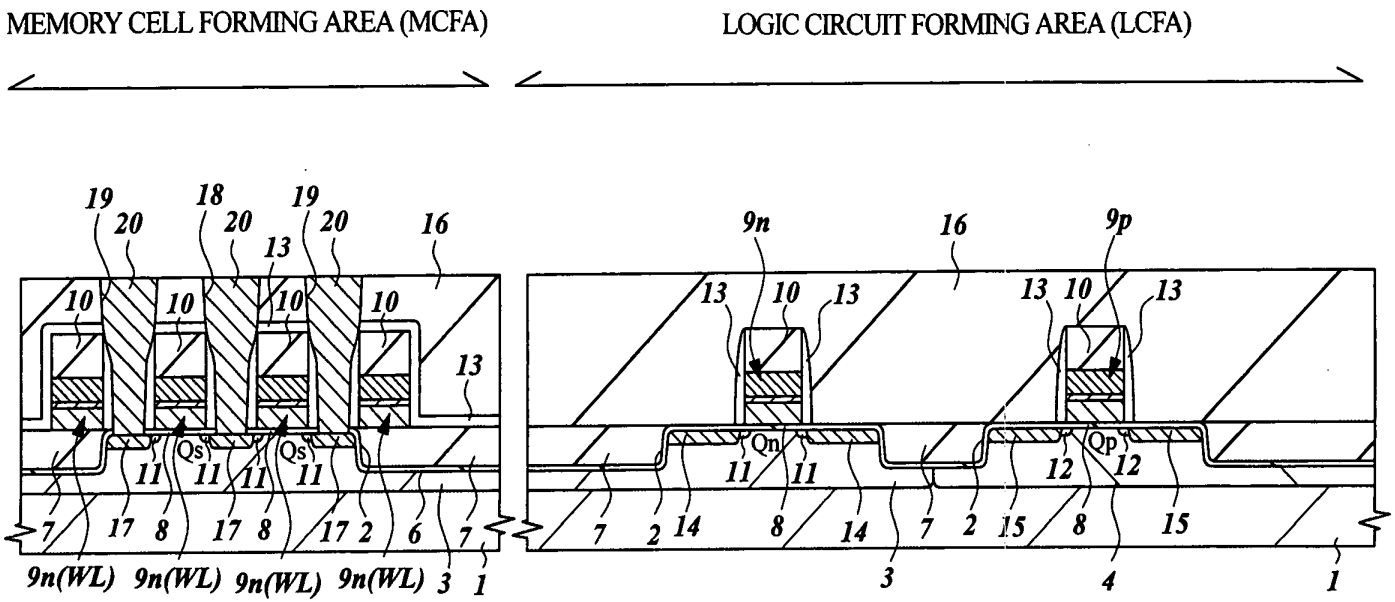

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
19
20
18
20
19
20
16
13
10
10
10
10
13
Qs
Qs
11
11
11
11
7
17
8
17
8
17
2
6
7
9n(WL)
9n(WL)
9n(WL)
9n(WL)
3
1
9n
16
9p
13
10
13
13
10
13
Qn
Qp
11
11
12
12
7
2
14
8
14
7
2
15
8
15
3
4
1

Fig. 3

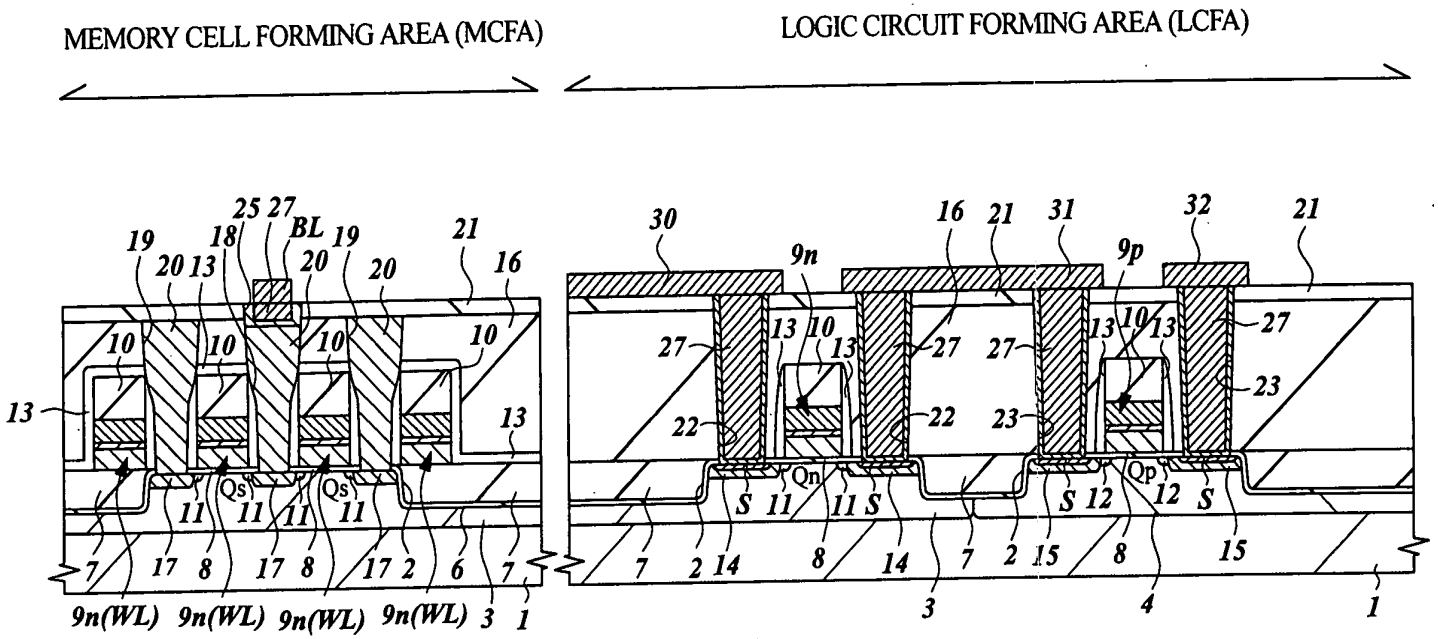

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
9n(WL)
9n(WL)
9n(WL)
9n(WL)
Qs
Qs
Qn
Qp

Fig. 4

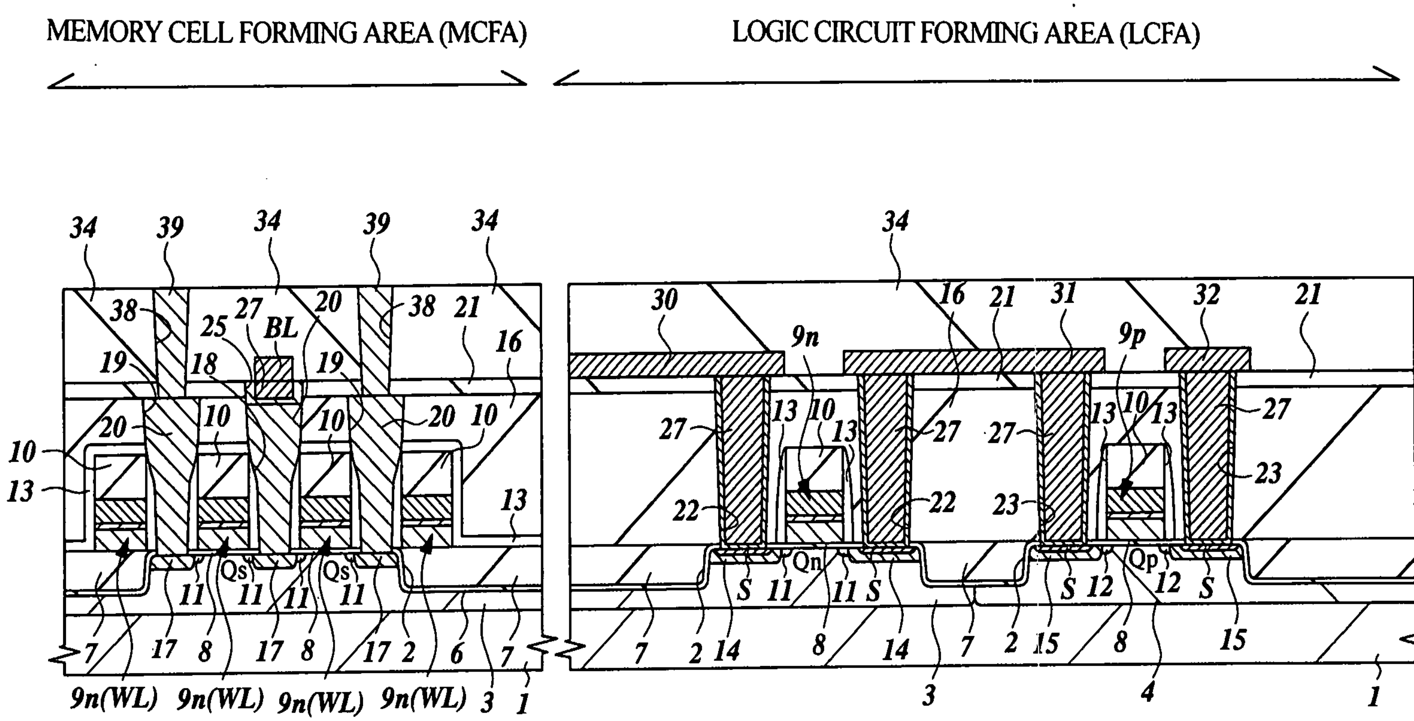

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
34
39
38
27
25
BL
20
19
18
21
16
10
13
Qs
11
17
8
7
2
6
3
1
9n(WL)
30
31
32
9n
9p
22
23
Qn
Qp
S
12
14
15
4

Fig. 5

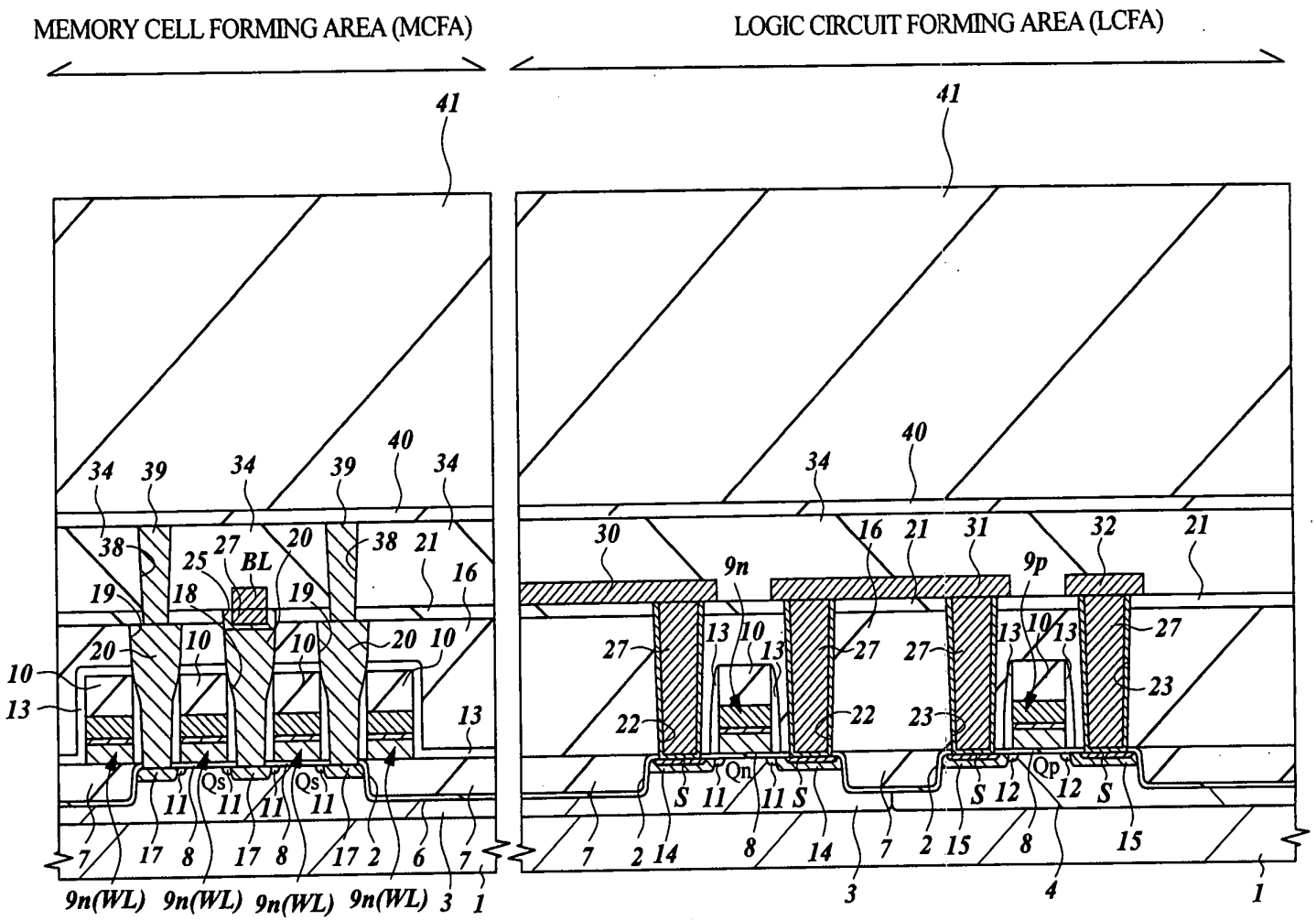
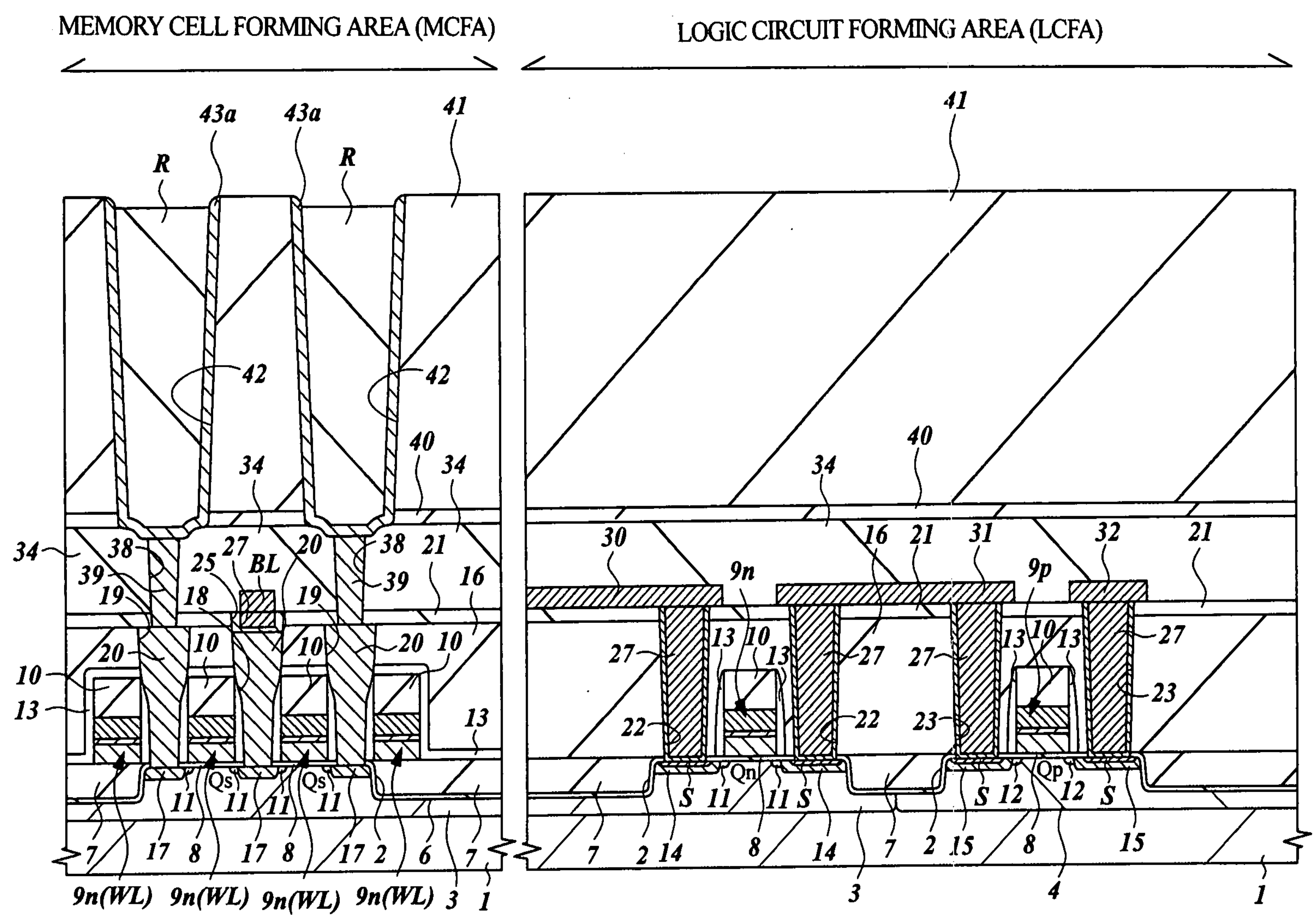

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
41
40
34
39
38
25
27
BL
20
21
16
19
18
10
13
Qs
11
17
8
2
6
7
3
1
9n(WL)
30
9n
31
9p
32
22
23
Qn
Qp
S
12
14
15
4

Fig. 6



MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
43a
43a
R
R
41
42
42
40
34
34
34
38
38
27
20
21
25
BL
39
39
19
18
19
16
10
20
10
20
10
10
13
13
Qs
Qs
11
11
11
11
7
17
8
17
8
17
2
6
7
9n(WL)
9n(WL)
9n(WL)
9n(WL)
3
1
41
40
34
30
16
21
31
32
21
9n
9p
27
13
10
13
27
27
13
10
13
27
23
22
22
23
Qn
Qp
S
11
11
S
S
12
12
S
7
2
14
8
14
7
2
15
8
15
3
4
1

Fig. 7

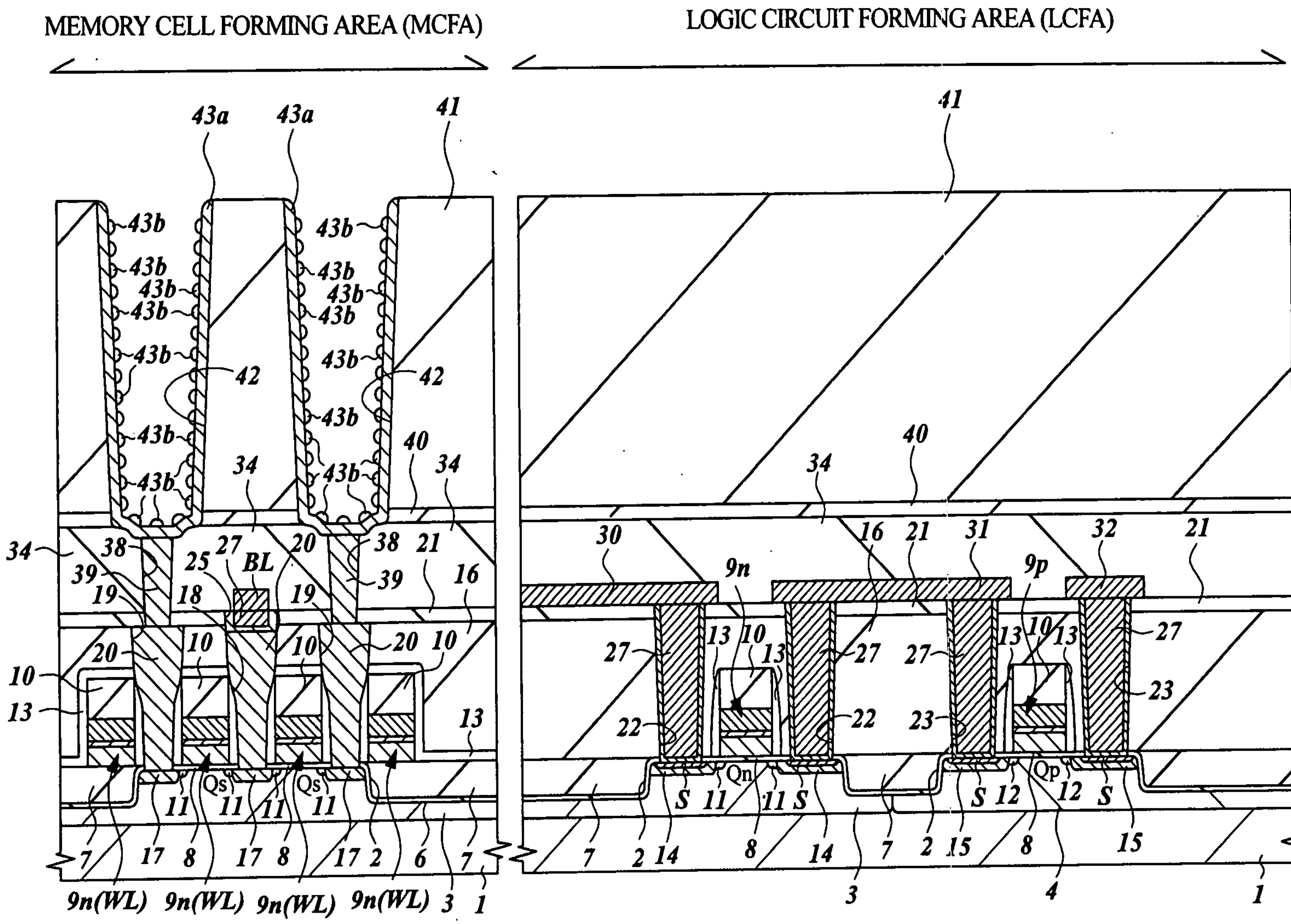

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
43a
43a
41
43b
42
40
34
38
39
19
20
10
13
27
25
BL
18
21
16
Qs
11
17
8
9n(WL)
7
2
6
3
1
30
9n
16
21
31
9p
32
22
23
Qn
Qp
S
12
14
15
4

Fig. 8

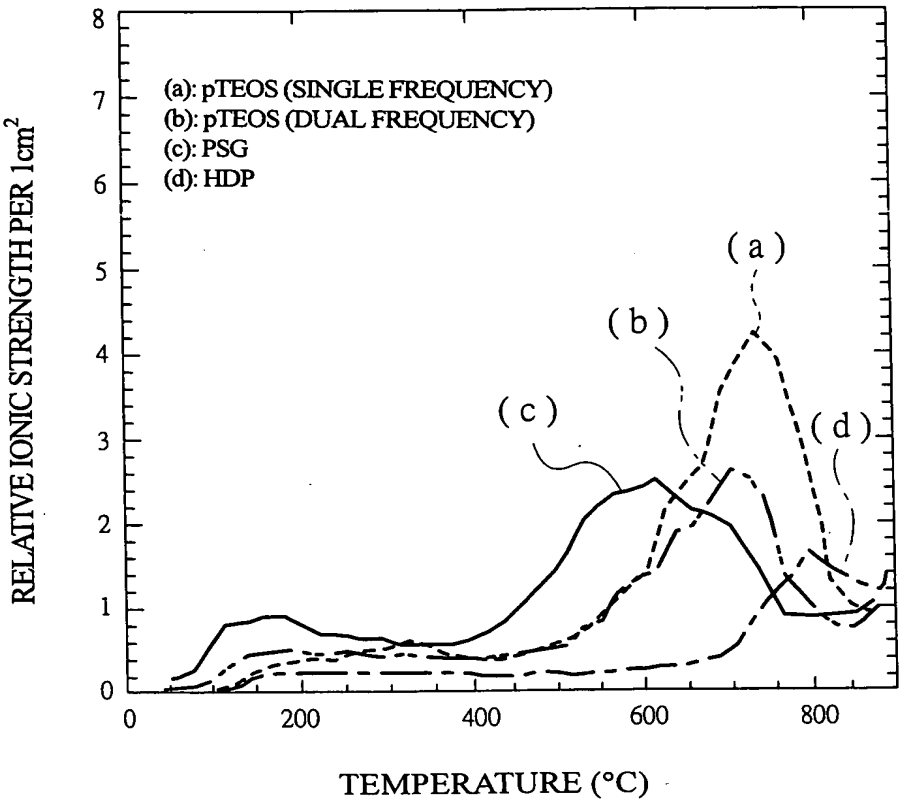

(a): pTEOS (SINGLE FREQUENCY)
(b): pTEOS (DUAL FREQUENCY)
(c): PSG
(d): HDP
RELATIVE IONIC STRENGTH PER 1cm2
TEMPERATURE (°C)
0
1
2
3
4
5
6
7
8
0
200
400
600
800
(a)
(b)
(c)
(d)

Fig. 9

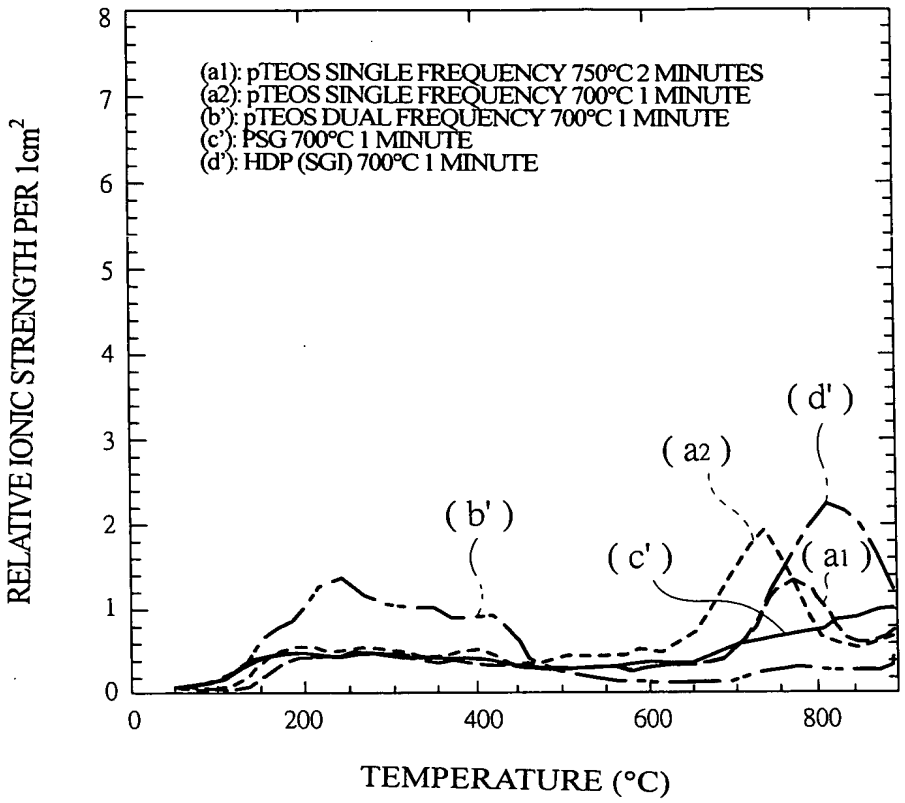

(a1): pTEOS SINGLE FREQUENCY 750°C 2 MINUTES
(a2): pTEOS SINGLE FREQUENCY 700°C 1 MINUTE
(b'): pTEOS DUAL FREQUENCY 700°C 1 MINUTE
(c'): PSG 700°C 1 MINUTE
(d'): HDP (SGI) 700°C 1 MINUTE
RELATIVE IONIC STRENGTH PER 1cm2
TEMPERATURE (°C)
0
1
2
3
4
5
6
7
8
0
200
400
600
800
(b')
(c')
(a2)
(d')
(a1)

Fig. 10

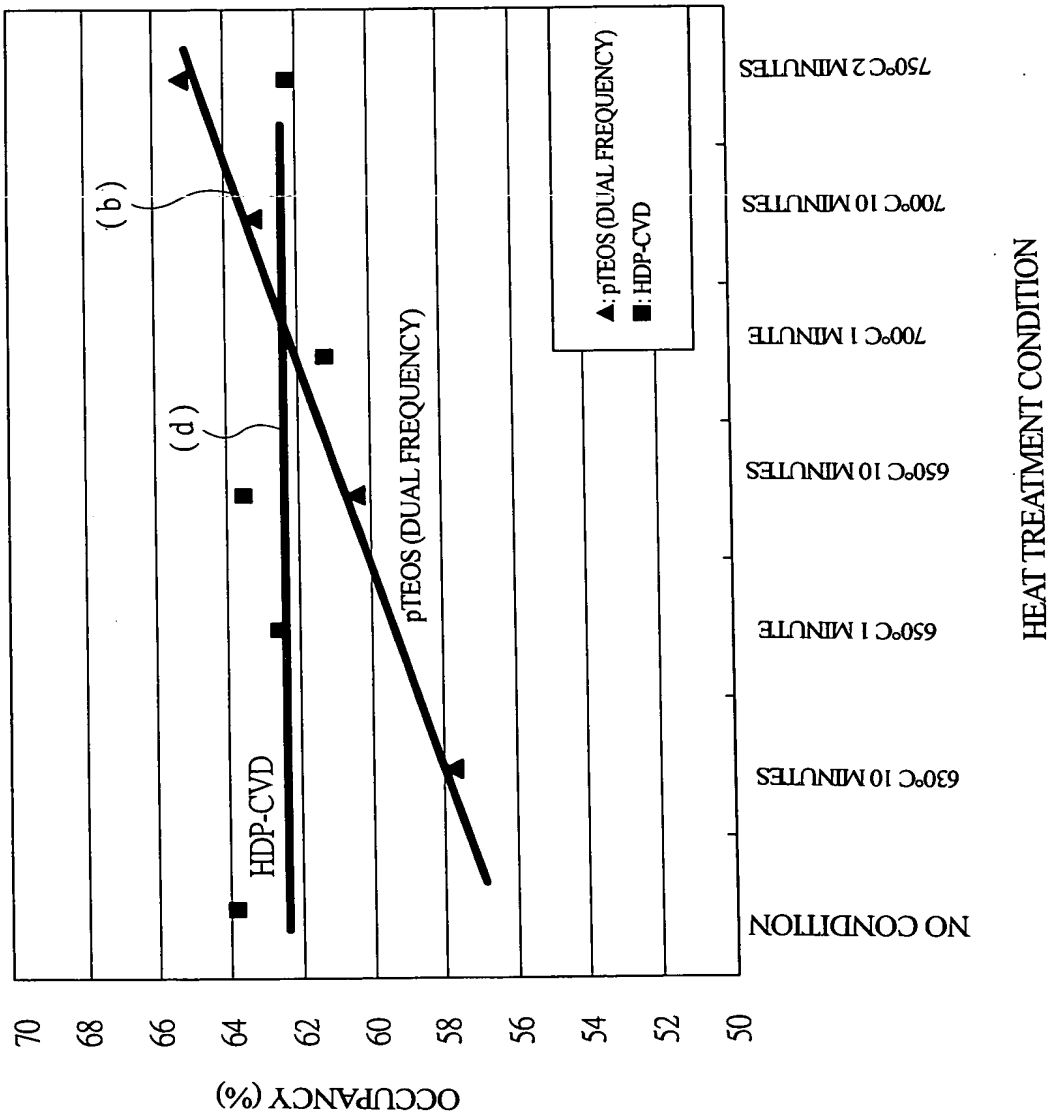

OCCUPANCY (%)
70
68
66
64
62
60
58
56
54
52
50
NO CONDITION
630°C 10 MINUTES
650°C 1 MINUTE
650°C 10 MINUTES
700°C 1 MINUTE
700°C 10 MINUTES
750°C 2 MINUTES
HEAT TREATMENT CONDITION
▲: pTEOS (DUAL FREQUENCY)
■: HDP-CVD
pTEOS (DUAL FREQUENCY)
HDP-CVD
(b)
(d)

Fig. 11

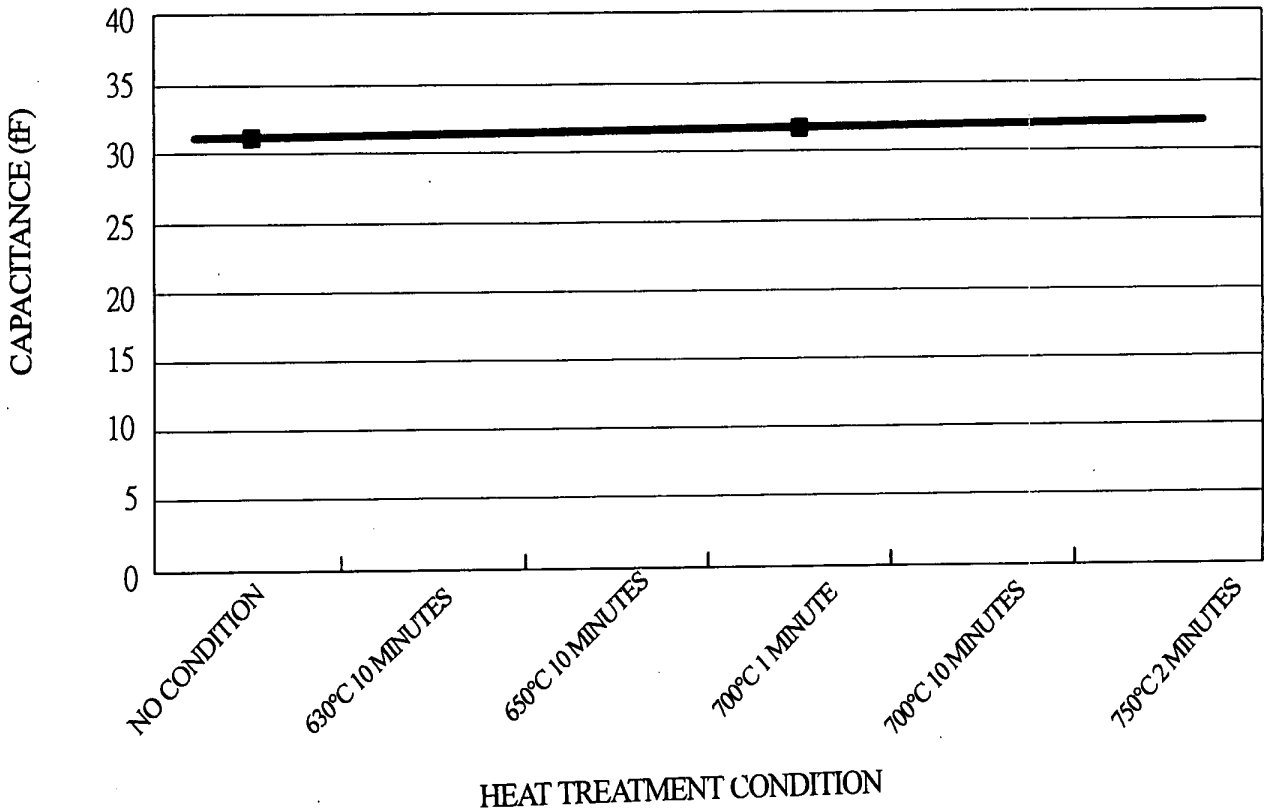

CAPACITANCE (fF)
40
35
30
25
20
15
10
5
0
NO CONDITION
630°C 10 MINUTES
650°C 10 MINUTES
700°C 1 MINUTE
700°C 10 MINUTES
750°C 2 MINUTES
HEAT TREATMENT CONDITION

Fig. 12

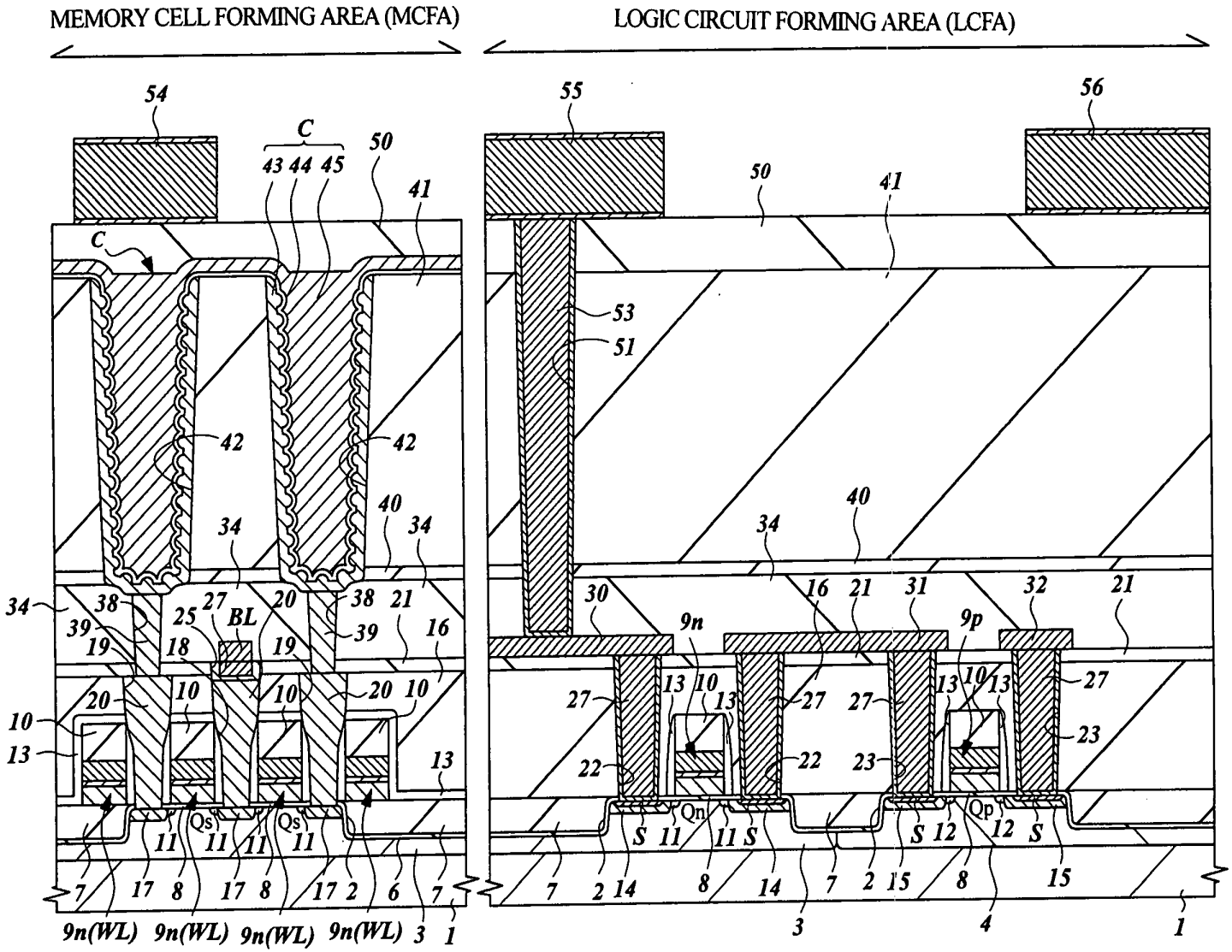


Fig. 13

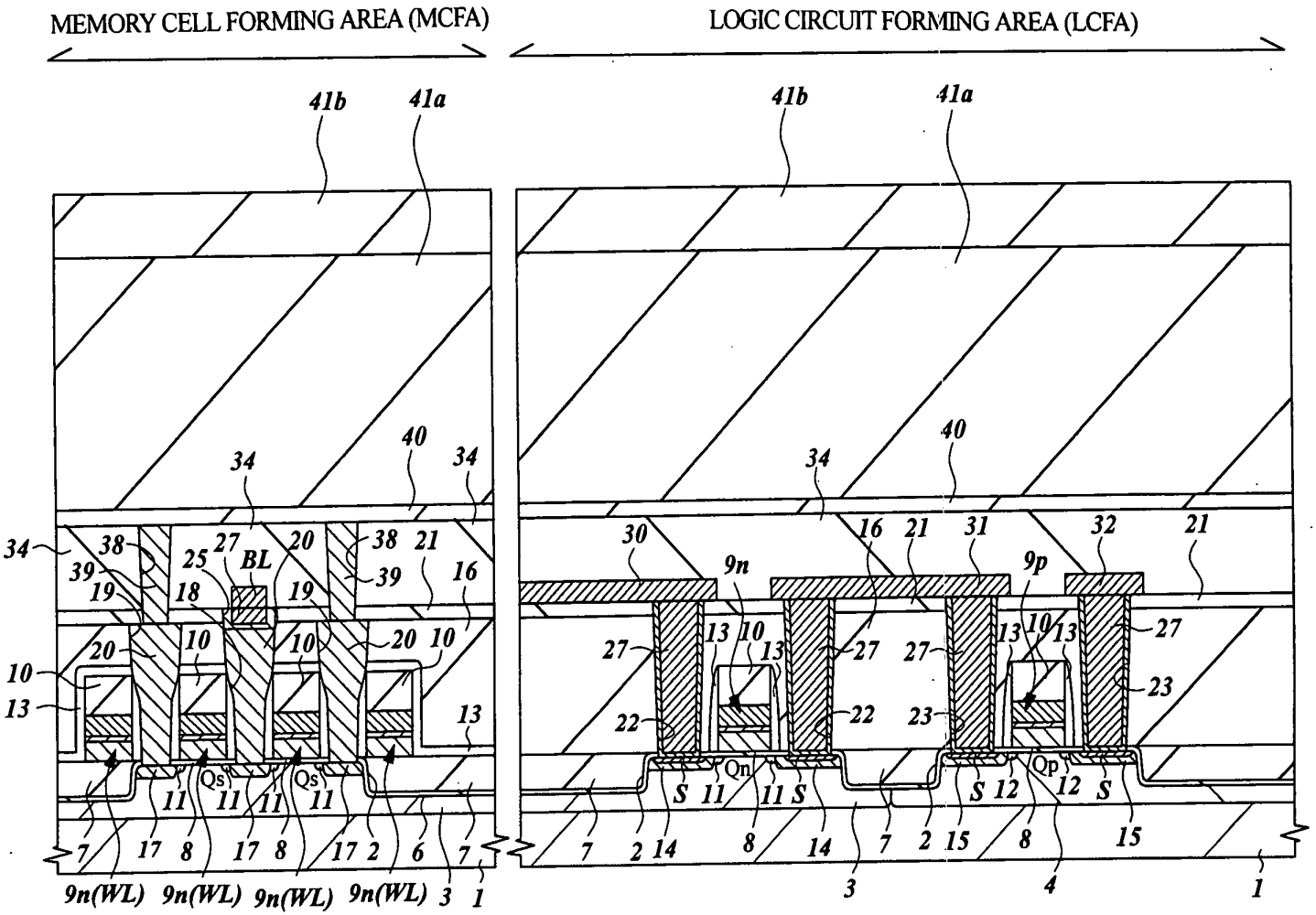

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
41b
41a
40
34
38
39
19
25
27
BL
18
20
21
16
10
13
Qs
11
17
8
2
6
7
9n(WL)
3
1
30
9n
31
32
9p
22
23
Qn
Qp
S
12
14
15
4

Fig. 14

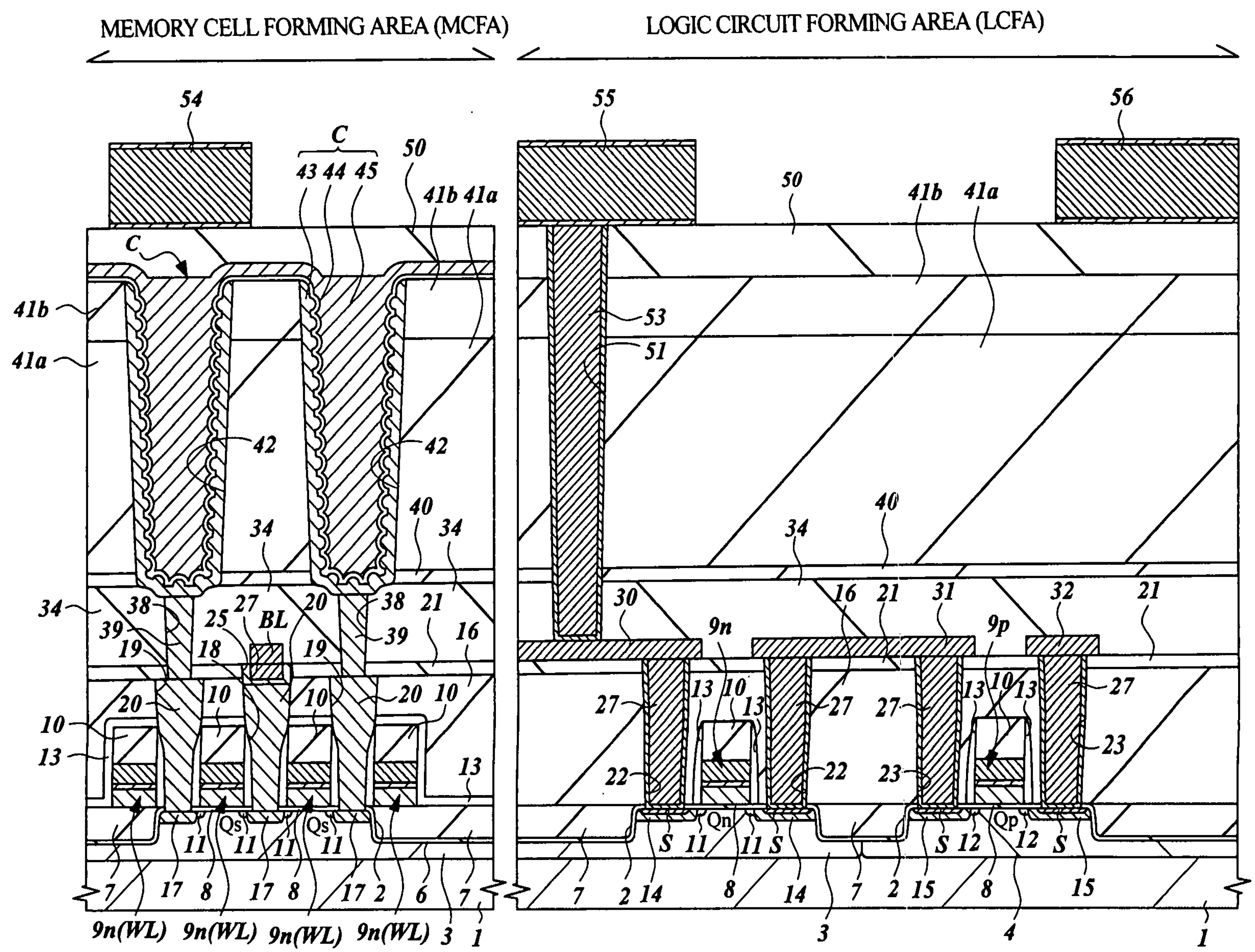

MEMORY CELL FORMING AREA (MCFA)
LOGIC CIRCUIT FORMING AREA (LCFA)
54
55
56
C
43 44 45
50
41b 41a
41b
41a
42
42
34
40
34
34
38
27
BL
20
38
21
25
39
19
18
19
39
16
20
10
10
20
10
10
13
13
Qs
Qs
11
11
11
11
7
17
8
17
8
17
2
6
7
9n(WL)
9n(WL)
9n(WL)
9n(WL)
3
1
53
51
50
41b
41a
40
34
30
16
21
31
32
21
9n
9p
27
13
10
13
27
27
13
10
13
27
22
22
23
23
Qn
Qp
S
11
11
S
S
12
12
S
7
2
14
8
14
7
2
15
8
15
3
4
1

Fig. 15

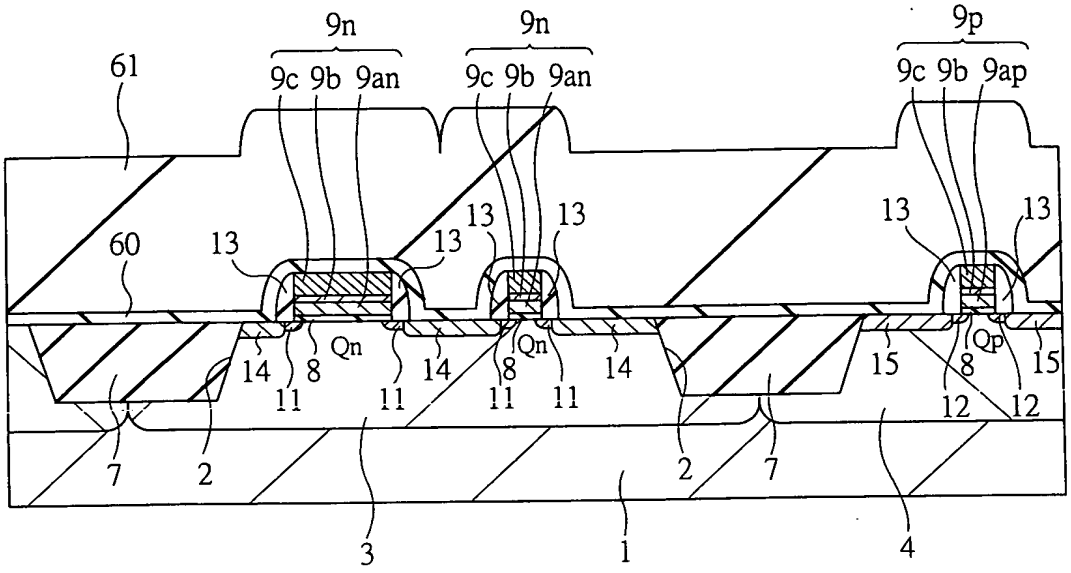
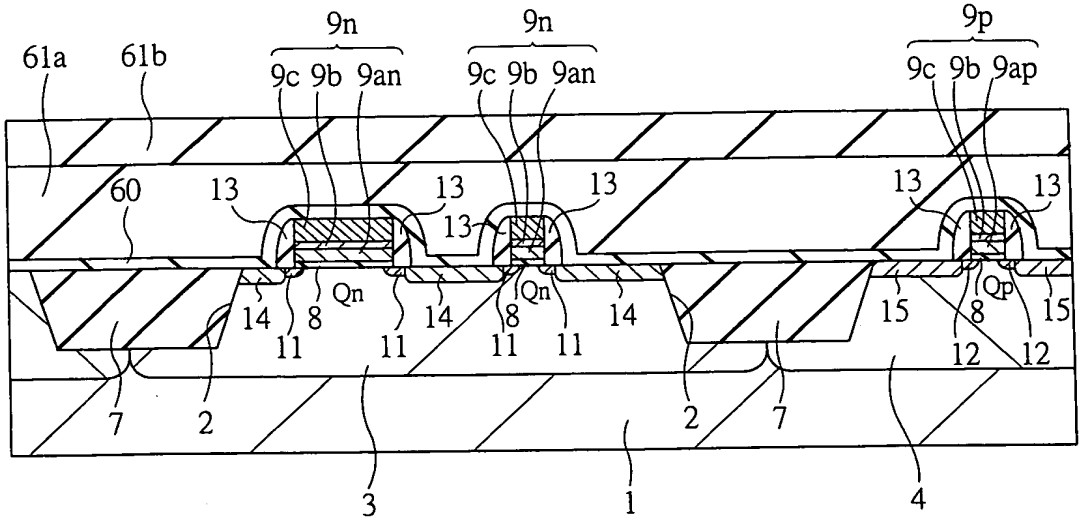

9n
9n
9p
61
9c 9b 9an
9c 9b 9an
9c 9b 9ap
60
13
13
13
13
13
13
13
Qn
Qn
Qp
14
14
14
15
15
8
8
8
11
11
11
11
11
12
12
7
2
2
7
3
1
4

Fig. 16


9n
9n
9p
61a
61b
9c 9b 9an
9c 9b 9an
9c 9b 9ap
60
13
13
13
13
13
13
13
Qn
Qn
Qp
14
14
14
15
15
8
8
8
11
11
11
11
11
12
12
7
2
2
7
3
1
4